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The role of protected areas in conserving lowland grassland and savannah ecosystems in latin america

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Abstract

Grasslands and Savannahs are among the most threatened ecosystems globally, experiencing rapid rates of land-use conversion. Despite this, they serve as reservoirs of endemic biodiversity and provide a wide range of essential multiple ecosystem services. In Latin America, these ecosystems cover approximately 13% of the total land area and play a pivotal role in agricultural production, particularly cattle ranching, while also holding significant historical and cultural value. However, the spatiotemporal dynamics of grassland productivity within protected areas (PAs) in regions with a long-standing emphasis on livestock, such as the Colombian Eastern Plains (Llanos Orientales) and the Argentine Pampas, remain poorly understood. While PAs contribute to the conservation of native flora and fauna, they represent only 3.7% to 12.8% of the study regions. In addition, private initiatives, such as Civil Society Reserves and Regenerative Cattle Ranching farms are emerging as key actors in promoting sustainable land management. Nevertheless, many of these initiatives have not been comprehensively assessed using integrative approaches that combine diverse sources of spatial data to evaluate their ecological impact at a regional scale. This study aimed to assess the contribution of both protected areas and private reserves to conservation efforts in grassland ecosystems of Colombia and Argentina. We analysed temporal and spatial dynamics using time series data from MapBiomas and MODIS MOD13Q1 products (2000–2025), alongside occurrence records of over 600 bird species from the Global Biodiversity Information Facility (GBIF). Our analysis compared vegetation productivity patterns—measured via NDVI and EVI—within protected areas and surrounding non-protected lands. Results show that grasslands and savannahs within protected areas have exhibited increasing productivity trends since 2010, in contrast to

stable patterns observed on adjacent farms. Additionally, biodiversity occurrences within and around protected areas exceed the regional average, with levels of endemism at least 20 % higher. These findings highlight the crucial role of private conservation initiatives in enhancing biodiversity knowledge and promoting sustainable management, especially in grassland regions threatened by afforestation, monoculture expansion, and fossil fuels extraction.

Keywords: Biodiversity, conservation , livestock, private reserves, productivity